

# PATENT ABSTRACTS OF JAPAN

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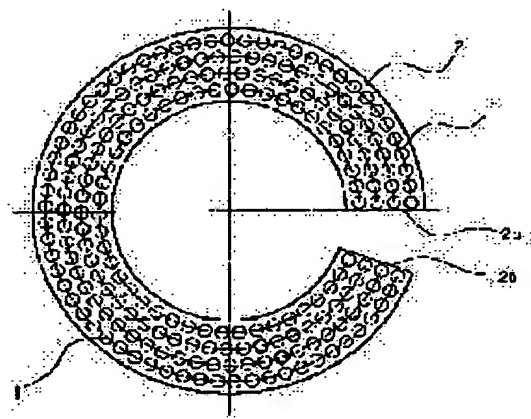
(72)Inventor : YONEDA KENJI

## (54) MANUFACTURE OF LIGHTING SYSTEM

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a lighting system, in an easy manner, wherein a plurality of illuminants are arranged in a truncated cone recessed surface, by implanting the illuminants in an annular ring-shaped bendable board having a notch with the board being held in a planar state, and by joining notch sides of the board with each other such that the illuminants are positioned on the recessed surface side.

**SOLUTION:** With an annular ring-shaped bendable printed circuit board 2 having a notch being held in a planar state, illuminants 1 are implanted in the board 2 by the method of soldering or the like. After that, when one cut-out side 2a of the board 2 and the other cut-out side 2b thereof are simply joined with or held close to each other, the printed circuit board 2 is necessarily formed into a truncated circular cone shape, and the illuminants 1 are arranged on the truncated circular cone recessed surface 2c. At this point, a power supply cable is also wired on the board 2 by the method of soldering or the like. A lighting system is completed by attaching the thus formed board 2 and illuminants 1 to a lighting case with a holding frame.



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decision of rejection]

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**CLAIMS**

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[Claim(s)]

[Claim 1] a part — the manufacture approach of the lighting system characterized by obtaining the lighting system which comes to arrange two or more emitters on a truncated cone concave surface by joining or contiguity holding one notching side of this substrate, and the notching side of another side so that an emitter may be located at a concave surface side after an appropriate time by implanting an emitter in this substrate after holding the turnable substrate of the shape of a circular ring which has notching in the flat-surface condition.

[Claim 2] The manufacture approach of a lighting system according to claim 1 that said substrate is characterized by being a printed-circuit board.

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## **DETAILED DESCRIPTION**

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### **[Detailed Description of the Invention]**

**[0001]**

**[Field of the Invention]** This invention relates to the manufacture approach of the lighting system used suitably, when carrying out an examination of products with reflected illumination.

**[0002]**

**[Description of the Prior Art]** As an approach of conducting surface analysis of a product etc., it illuminates for a product using the lighting system which emits light from a base, and, more generally than before, the method of performing viewing or photography and inspecting the reflected light [ near this lighting system ], is learned. If luminous-intensity nonuniformity exists in a control surface at this time, the case where faults, such as a very small blemish of a control surface and result condition, are undetectable will arise. Therefore, emitters, such as two or more LED, are everywhere laid on a lighting-system base, and what was made into structure which is made to carry out field luminescence of the light-emitting part, and keeps the luminous intensity of a control surface constant without nonuniformity is often used. Especially, when an inspected object is three-dimensional, and it is necessary to illuminate so that it may cover also from a perimeter only from an one direction to an inspected object, what has the structure which comes to arrange two or more emitters on a truncated cone concave surface is used for the luminescence side at the base of a lighting system in many cases.

**[0003]**

**[Problem(s) to be Solved by the Invention]** By the way, in order to lay an emitter everywhere on the base of this lighting system as it is the lighting system of the above configurations, this lighting-system base was processed a truncated cone concave surface or in the shape of a cone concave surface, two or more these concave surfaces were punched, the emitter was respectively laid under this hole directly, and the complicated process of giving an arrangements line was still more nearly required for each emitter. For this reason, since all processes, such as base processing of equipment and a punching include angle, differed in order assembly is difficult and to manufacture the lighting system of the variety which changed whenever [ angle-of-emergence / of light ] not to mention assembly time amount becoming long, the fault of being hard to standardize an activity arose.

**[0004]** This invention is made in view of such the actual condition, and aims at offering the manufacture approach of the lighting system characterized by the ability to manufacture easily the lighting system which comes to arrange two or more emitters on a truncated cone concave surface.

**[0005]**

**[Means for Solving the Problem]** In order to solve the above-mentioned trouble, a part of this invention implants an emitter in this substrate, after holding the turnable substrate of the shape of a circular ring which has notching in the flat-surface condition, and he is trying to join or contiguity hold so that an emitter may be located in after an appropriate time in one notching side of this substrate, and the notching side of another side at a concave surface side. By this approach, two or more emitters can be easily arranged on a truncated cone concave surface.

**[0006]**

[Embodiment of the Invention] Namely, a part of this invention implants emitters, such as LED, in this substrate, after holding the turnable substrate of the shape of a circular ring which has notching in the flat-surface condition. After an appropriate time One notching side of this substrate, and the notching side of another side so that an emitter may be located in a concave surface side It is the manufacture approach of the lighting system characterized by obtaining the lighting system which arranges two or more emitters on a truncated cone concave surface, and comes to attach an emitter in a lighting-system base this whole substrate by joining or contiguity holding.

[0007] In order to do the wiring activity of each emitter, and the implantation activity to a substrate on coincidence and to simplify assembly operation further especially, it is desirable to use a printed-circuit board for this substrate.

[0008]

[Example] Hereafter, one example of this invention is explained with reference to a drawing. In drawing 1 , in lighting-system 4 base, the illuminants 1, such as two or more LED, are arranged at truncated cone concave surface 2c on the printed-circuit board 2 with a turnable flexible substrate etc., and the lighting case 3 holds the illuminant 1 the whole substrate 2. Power is supplied to each illuminant 1 from a power cable 5 through said substrate 2. The lighting case 3 has the feed hole 32 for viewing or photography, and said emitter 1 and the maintenance frame 33 of a substrate 2. Moreover, the female screw 31 drilled by the lighting case 3 is for attaching a lighting system 4.

[0009] In such a configuration, the manufacture approach of the lighting system by this invention is explained. After holding the turnable printed-circuit board 2 of the shape of a circular ring which has notching in part as shown in drawing 2 in the flat-surface condition, an emitter 1 is implanted in this substrate 2 by approaches, such as soldering. After an appropriate time, only by joining or contiguity holding one notching side 2a of this substrate 2, and notching side 2b of another side so that an emitter 1 may be located at a concave surface side, this printed circuit board 2 serves as a truncated cone mold inevitably, and an emitter 1 is arranged at truncated cone concave surface 2c. At this time, a power cable 5 also wires this substrate 2 with soldering etc. Thus, the substrate 2 and emitter 1 which were formed are attached in the lighting case 3 with the maintenance frame 33, and this lighting system 4 is completed.

[0010] Since in the manufacture approach of such a lighting system 4 the printed-circuit board 2 is used in becoming possible by the same approach as carrying electronic parts in the usual printed-circuit board as usual, since the arrangement to truncated cone concave surface 2c of an emitter 1 can carry out in the state of a flat surface, implanting an emitter 1 in a substrate 2 by approaches, such as soldering, will serve as a wiring activity to coincidence, and assembly operation is simplified. Moreover, only by joining or contiguity holding one notching side 2a of this substrate 2, and notching side 2b of another side so that an emitter 1 may be located in a concave surface side, this printed circuit board 2 is crooked, and serves as a truncated cone form inevitably, and it becomes possible to arrange an emitter 1 to truncated cone concave surface 2c easily. It becomes unnecessary and to be able to attach easily in lighting case 3 base the substrate 2 and emitter 1 which were formed in this way with the maintenance frame 33, and to drill cone concave surface-like processing and the hole for emitter laying-under-the-ground maintenance in the lighting case 3. Moreover, as shown in drawing 3 and drawing 4 , when the truncated cone side which has the magnitude and the include angle of arbitration can be easily manufactured by changing the magnitude of the diameter of a circular ring of a substrate 2, or notching, if the maintenance frame 33 is changed so that it may be suited, modification of a luminescence include angle can respond easily by modification of some lighting systems.

[0011] In addition, this invention is not limited to the example explained above. For example, a substrate 2 may be made into an ellipse ring with notching, and you may carry out changing a luminescence side configuration etc. In addition, the configuration of each part is not limited to the example of illustration, and can deform variously in the range which does not deviate from the meaning of this invention.

[0012]

[Effect of the Invention] This invention is carried out with a gestalt which was explained above,

and does so effectiveness which is indicated below. An emitter is implanted in this substrate, after using the turnable substrate of the shape of a circular ring which has notching in part and holding this substrate in the flat-surface condition. Since two or more emitters can be easily arranged after an appropriate time at a truncated cone concave surface by joining or contiguity holding one notching side of this substrate, and the notching side of another side so that an emitter may be located at a concave surface side, Complicated processing to a lighting-system base becomes unnecessary, assembly also becomes easy, and assembly time amount can be shortened. Moreover, since whenever [ luminescence face angle ] can be easily changed by modification of the diameter of a circular ring of a substrate, and the magnitude of notching, manufacture of the lighting system of the variety which changed whenever [ angle-of-emergence / of light ] becomes easy so that it may be suitable for the lighting of an inspected object.

[0013] Moreover, if a printed-circuit board is used for this substrate, in order that the implantation activity to the substrate of each emitter may serve as a wiring activity, the complicated activity of giving an arrangements line to each emitter is omitted, and assembly operation is simplified further.

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**TECHNICAL FIELD**

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[Field of the Invention] This invention relates to the manufacture approach of the lighting system used suitably, when carrying out an examination of products with reflected illumination.

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**PRIOR ART**

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[Description of the Prior Art] As an approach of conducting surface analysis of a product etc., it illuminates for a product using the lighting system which emits light from a base, and, more generally than before, the method of performing viewing or photography and inspecting the reflected light [ near this lighting system ], is learned. If luminous-intensity nonuniformity exists in a control surface at this time, the case where faults, such as a very small blemish of a control surface and result condition, are undetectable will arise. Therefore, emitters, such as two or more LED, are everywhere laid on a lighting-system base, and what was made into structure which is made to carry out field luminescence of the light-emitting part, and keeps the luminous intensity of a control surface constant without nonuniformity is often used. Especially, when an inspected object is three-dimensional, and it is necessary to illuminate so that it may cover also from a perimeter only from an one direction to an inspected object, what has the structure which comes to arrange two or more emitters on a truncated cone concave surface is used for the luminescence side at the base of a lighting system in many cases.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] This invention is carried out with a gestalt which was explained above, and does so effectiveness which is indicated below. An emitter is implanted in this substrate, after using the turnable substrate of the shape of a circular ring which has notching in part and holding this substrate in the flat-surface condition. Since two or more emitters can be easily arranged after an appropriate time at a truncated cone concave surface by joining or contiguity holding one notching side of this substrate, and the notching side of another side so that an emitter may be located at a concave surface side, Complicated processing to a lighting-system base becomes unnecessary, assembly also becomes easy, and assembly time amount can be shortened. Moreover, since whenever [ luminescence face angle ] can be easily changed by modification of the diameter of a circular ring of a substrate, and the magnitude of notching, manufacture of the lighting system of the variety which changed whenever [ angle-of-emergence / of light ] becomes easy so that it may be suitable for the lighting of an inspected object.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] By the way, in order to lay an emitter everywhere on the base of this lighting system as it is the lighting system of the above configurations, this lighting-system base was processed a truncated cone concave surface or in the shape of a cone concave surface, two or more these concave surfaces were punched, the emitter was respectively laid under this hole directly, and the complicated process of giving an arrangements line was still more nearly required for each emitter. For this reason, since all processes, such as base processing of equipment and a punching include angle, differed in order assembly is difficult and to manufacture the lighting system of the variety which changed whenever [ angle-of-emergence / of light ] not to mention assembly time amount becoming long, the fault of being hard to standardize an activity arose.

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**MEANS**

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[Means for Solving the Problem] In order to solve the above-mentioned trouble, a part of this invention implants an emitter in this substrate, after holding the turnable substrate of the shape of a circular ring which has notching in the flat-surface condition, and he is trying to join or contiguity hold so that an emitter may be located in after an appropriate time in one notching side of this substrate, and the notching side of another side at a concave surface side. By this approach, two or more emitters can be easily arranged on a truncated cone concave surface.  
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## EXAMPLE

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] The cross-sectional view of the lighting system in which one example of this invention is shown.

[Drawing 2] The front view showing the substrate carrying the emitter before the assembly of the lighting system in drawing 1 .

[Drawing 3] The cross-sectional view of the lighting system in which the modification of this example is shown.

[Drawing 4] The front view showing the substrate carrying the emitter before the assembly of the lighting system in drawing 3 .

[Description of Notations]

1 ... Emitter

2 ... Substrate

2a ... Notching side

2b ... The notching side of another side

2c ... Truncated cone concave surface

4 ... Lighting system

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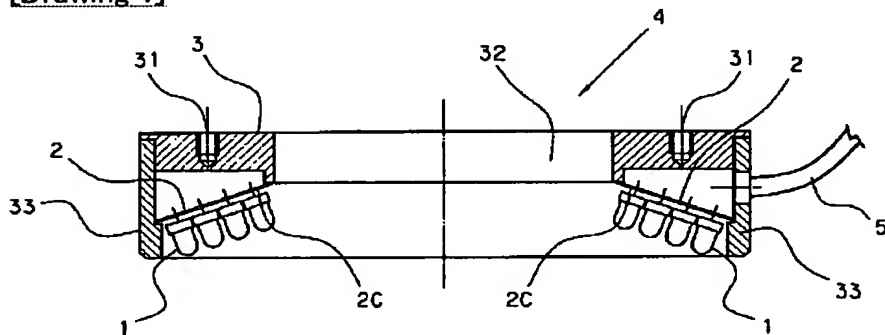
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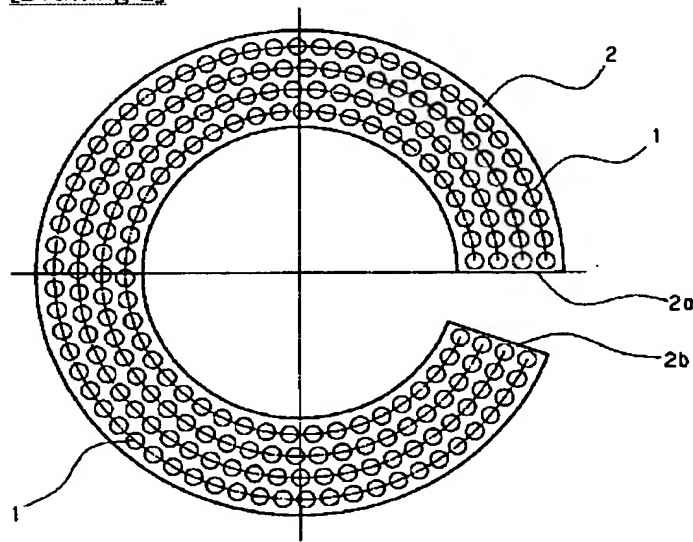
**DRAWINGS**

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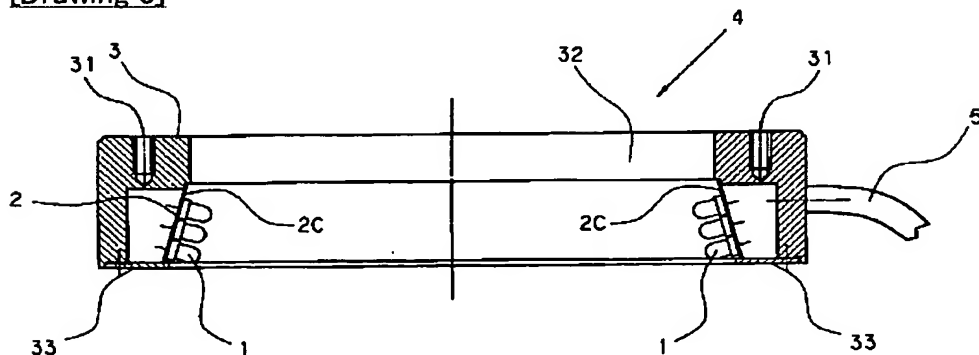
**[Drawing 1]**



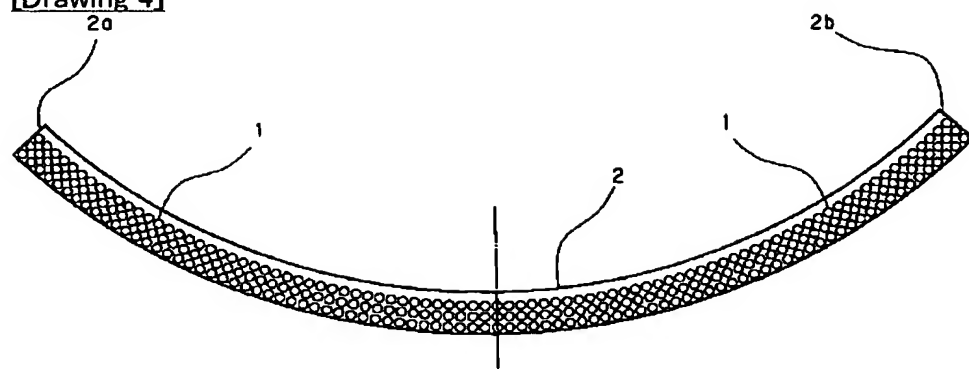
**[Drawing 2]**



**[Drawing 3]**



[Drawing 4]



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